

Amendment and Response

Applicant: Gerold Gruendler et al.

Serial No.: 10/598,285

Filed: June 21, 2007

Docket No.: I431.174.101/FIN565PCT/US

Title: COOLING SYSTEM FOR DEVICES HAVING POWER SEMICONDUCTORS AND METHOD FOR COOLING THE DEVICE

IN THE CLAIMS

Please cancel claims 12, 13, 20, 21, and 29 without prejudice.

Please add claims 30-33.

Please amend claims 10, 14, 16, 18, 22, and 24-28 as follows:

1.-9. (Cancelled)

10. (Currently Amended) A cooling system for devices comprising power semiconductor components, the power semiconductor components being arranged on printed circuit boards along with non-power type semiconductor components, the printed circuit boards arranged in plug-in contact strips of a superordinate circuit carrier, the cooling system comprising:

a cooling plate, which is mounted in a pivotable manner on a plug-in contact strip in a region of one of the power semiconductor components, and which can be pivoted about an axis parallel to the plug-in contact strip, and a cooling grid structure fitted on edges of the cooling plate and projecting in directions parallel to the plug-in contact strip,

the cooling plate having a first mounting and maintenance position pivoted away from the power semiconductor component, and a second cooling and operating position wherein the cooling plate is pressed onto and covers only the power semiconductor component and the cooling grid structure covers the remaining non-power semiconductor components arranged on the printed circuit board adjacent to the power semiconductor component.

11. (Previously Presented) The cooling system as claimed in claim 10, comprising wherein the cooling plate has cooling fins on the cooling plate side not in contact with the power semiconductor component.

12. (Cancelled)

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13. (Cancelled)

14. (Currently Amended) The cooling system as claimed in claim 12~~claim 10~~, comprising wherein ~~the~~ cooling grid structure is arranged at an upper edge side of the cooling plate and projects beyond an upper edge of the printed circuit board and into a cooling air stream ~~L~~Estream.

15. (Previously Presented) The cooling system as claimed in claim 10, comprising wherein a cooling air stream device that generates a cooling air stream is arranged in such a way that it has a forced cooling parallel to the plug-in contact strips of the device to be cooled.

16. (Currently Amended) The cooling system as claimed in claim 10, comprising wherein a cooling air stream device that generates a cooling air stream which is arranged in such a way that it has a forced cooling perpendicular to the plug-in contact strips of the device to be cooled, and into which forced cooling project the cooling grid structures connected to the cooling plate projects.

17. (Previously Presented) The cooling system as claimed in claim 10, comprising wherein the cooling system has two cooling plates which are opposite one another and which are arranged in a pivotable manner on a plug-in contact strip in the region of a power semiconductor component.

18. (Currently Amended) A power semiconductor device having a cooling system comprising:

~~at least one or more power semiconductor components, the power semiconductor components being arranged on printed circuit boards~~board arranged in one of a plurality of plug-in contact strips of a superordinate circuit carrier and having at least one power semiconductor component positioned thereon and a plurality of other semiconductor components arranged adjacent thereto;

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a cooling plate, which is mounted in a pivotable manner on at the plug-in contact strip in a region of the at least one of the power semiconductor components, component and configured to be pivoted about an axis parallel to the plug-in contact strip; and

a cooling grid structure fitted on and extending from edges of the cooling plate, the cooling plate having a first mounting and maintenance position pivoted away from the power semiconductor component, and a second cooling and operating position wherein the cooling plate is pressed onto the power semiconductor component and the cooling grid structure covers at least a portion of the plurality of other semiconductor components.

19. (Previously Presented) The device as claimed in claim 18, comprising wherein the cooling plate has cooling fins on the cooling plate side not in contact with the power semiconductor component.

20. (Cancelled)

21. (Cancelled)

22. (Currently Amended) The device as claimed in ~~claim 20~~ claim 18, comprising wherein a cooling grid structure is configured at an upper edge side of the cooling plate and projects beyond an upper edge of the printed circuit board and into a cooling air stream ~~L~~ stream.

23. (Previously Presented) The device as claimed in claim 18, comprising wherein a cooling air stream device that generates a cooling air stream is arranged in such a way that it has a forced cooling parallel to the plug-in contact strips of the device to be cooled.

24. (Currently Amended) The device as claimed in claim 18, comprising wherein a cooling air stream device that generates a cooling air stream ~~which is arranged in such a way that it has a forced cooling~~ perpendicular to the plug-in contact strips of the device to be cooled, ~~and~~ into

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which forced cooling project ~~the~~ cooling grid structures connected to the cooling plate projects.

25. (Currently Amended) The device as claimed in claim 18, comprising wherein the cooling system has two cooling plates which are opposite one another and which are arranged a second cooling plate is mounted in a pivotable manner on ~~the~~ plug-in contact strip in the region of a power semiconductor component ~~opposite to the cooling plate and on an other side of the printed circuit board.~~

26. (Currently Amended) A method for cooling a device having power semiconductor components, the method comprising:

mounting pivotable cooling plates onto plug-in contact strips ~~in the regions of power semiconductor components of a superordinate circuit carrier, the cooling plates being in a first mounting and maintenance position and having a cooling grid structure fitted on and extending from edges thereof;~~

fitting printed circuit boards with power semiconductor components onto the plug-in contact strips and, ~~the printed circuit boards having at least one power semiconductor component positioned thereon and a plurality of other semiconductor components arranged adjacent thereto, wherein the cooling plates are positioned along the plug-in contact strip in regions of the power semiconductor components;~~

pivoting the cooling plates about an axis parallel to the plug-in contact strip into a second cooling or operating position, ~~in which wherein the cooling plate bears plates are held in contact with a corresponding on the power semiconductor component of a corresponding printed circuit board and the cooling grid structure covers the plurality of other semiconductor components adjacent thereto;~~

orienting a device generating a cooling air stream, such that the cooling air stream flows parallel or perpendicular to the plug-in contact strips; and

providing the cooling air stream during operation of the power semiconductor components in the event of a critical temperature of the power semiconductor components being

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reached.

27. (Currently Amended) A cooling system for devices comprising at least one power semiconductor componentscomponent, the power semiconductor componentscomponent being arranged, along with a plurality of other semiconductor components, on a printed circuit boardsboard arranged in a plug-in contact stripsstrip of a superordinate circuit carrier, the cooling system comprising:

~~means for providing a cooling plate, which is mounted in a pivotable manner on to the plug-in contact strip in a region of one of the at least one power semiconductor components~~component, the cooling plate having a cooling grid structure fitted on and extending from edges thereof, and which can be pivoted about an axis parallel to the plug-in contact strip;

~~means for moving~~pivoting the cooling plate about an axis parallel to the plug-in contact strip~~means between a first mounting and maintenance position pivoted wherein the cooling plate is away from the power semiconductor component, and a second cooling and operating position wherein the cooling plate is pressed onto the power semiconductor component and~~.

28. (Currently Amended) The cooling system as claimed in claim 27, comprising wherein the cooling plate ~~mean~~ has cooling fins on the cooling plate side not in contact with the power semiconductor component.

29. (Cancelled)

30. (New) The cooling system of claim 10, wherein the cooling grid structure comprises metallic strips or cooling fins arranged at right angles to one another.

31. (New) The power semiconductor device of claim 18, wherein the other semiconductor components comprise semiconductor memory components.

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32. (New) The power semiconductor device of claim 18, wherein the cooling grid structure comprises metallic strips or cooling fins arranged at right angles to one another.

33. (New) The cooling system of claim 27, wherein the cooling grid structure comprises metallic strips or cooling fins arranged at right angles to one another.